Roadside Geology of Manitoba – a user's guide to the province's unique geological features

by

J.D. Bamburak

Manitoba Mining and Minerals Convention

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Roadside Geology Field Trips

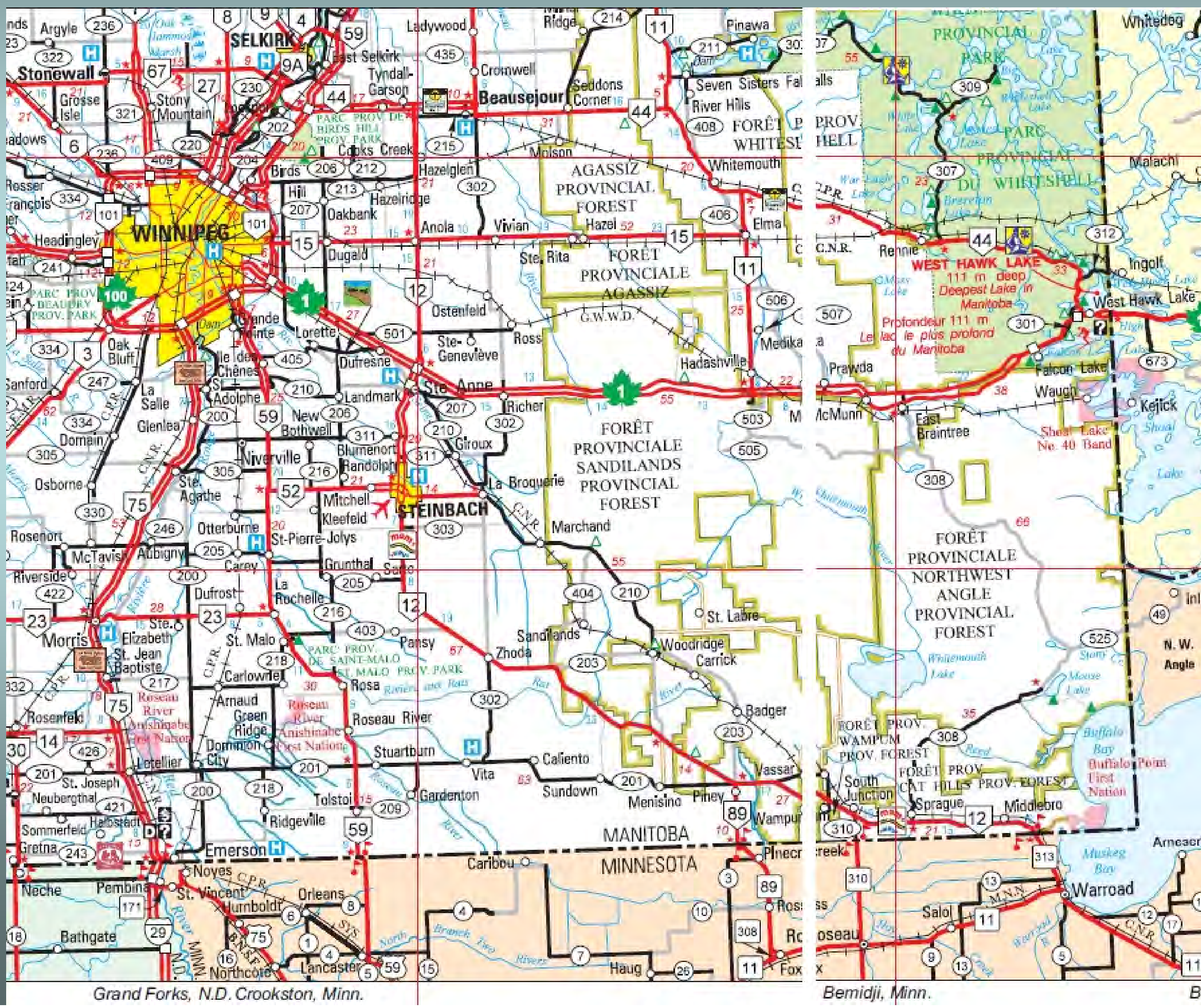
- Eastern – Trans-Canada Highway from Winnipeg to the Whiteshell and return by PTH 44 and 59.
- Western – PTH 3 from Winnipeg and return by Trans-Canada Highway.

Geological Format of Presentation

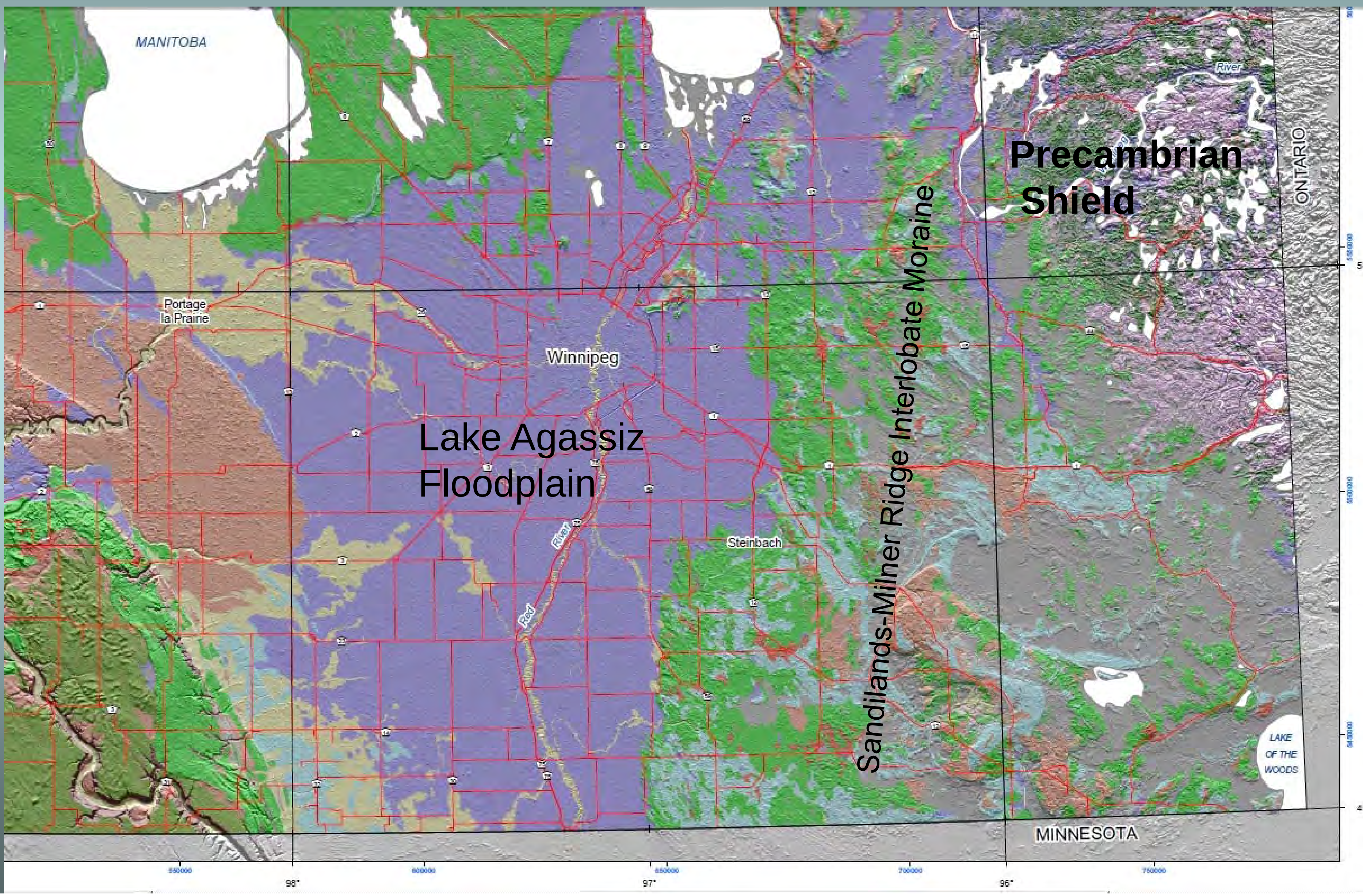
- Recent – <10 000 years before present (BP)
- Pleistocene – 1.8 Ma to 10 000 years BP
- Cenozoic – 65 Ma to 1.8 Ma
- Mesozoic – 251 Ma to 65 Ma
- Paleozoic – 542 Ma to 251 Ma
- Precambrian (SE MB) – > 2.5 Ga

(International Stratigraphic Chart)

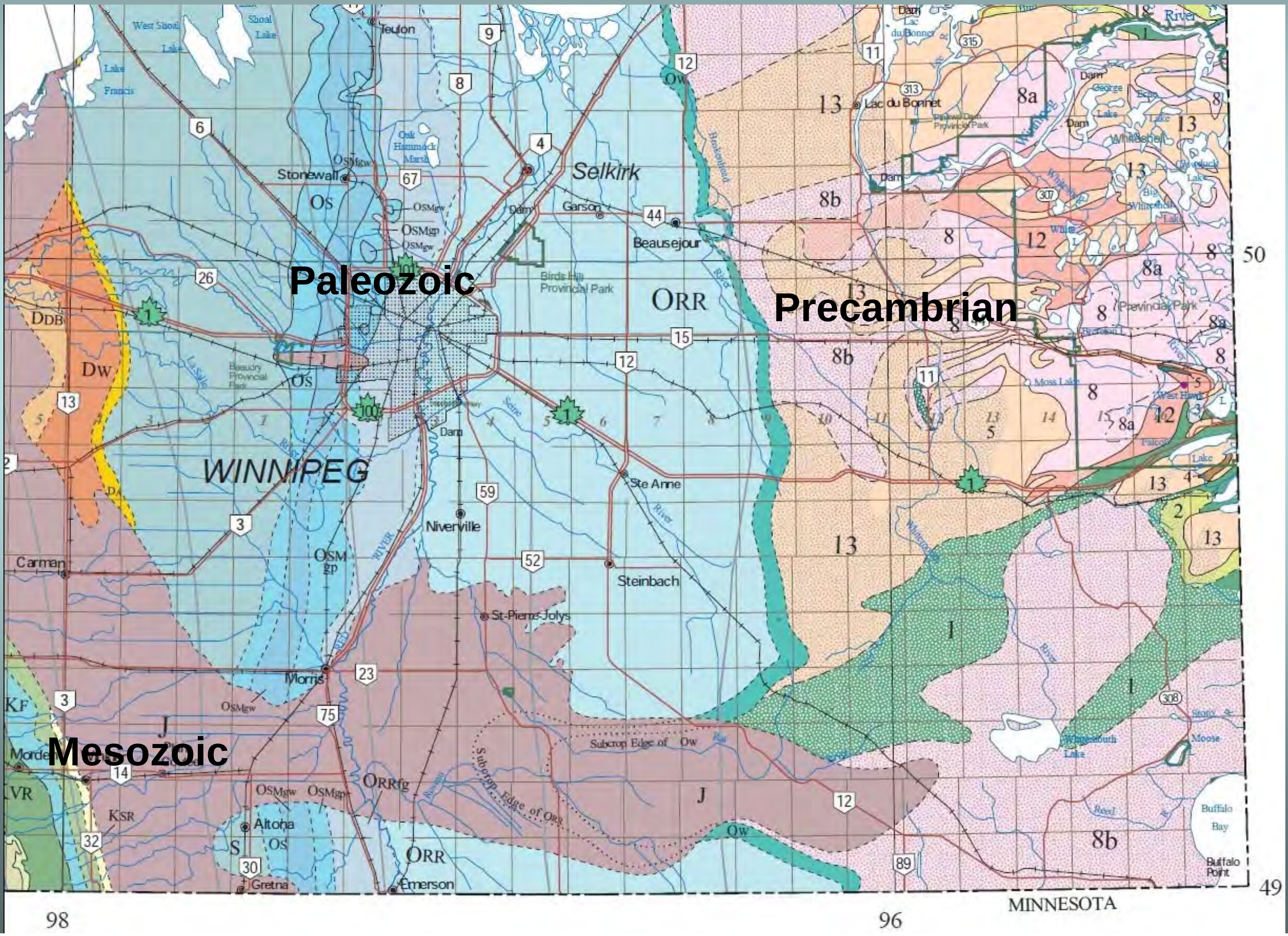
Eastern Roadside Geology Field Trip



Surficial Geology



Bedrock Geology



Geological Features

- Winnipeg Floodway Gypsum Rosettes
- Iceberg Scour Marks
- Sandilands-Milner Ridge Interlobate Moraine (Richer East – Sand and Gravel)
- Winnipeg Aqueduct
- Precambrian Shield

Geological Features

- Whiteshell Provincial Park
  - Falcon Creek Hiking Trail
  - Pillow Lava
  - Mineral occurrences (including gold mines) in the West Hawk – Falcon Lake area
  - West Hawk Lake Meteorite Crater & Museum
  - Lily Pond Lake
  - Rennie (Goose Sanctuary)
  - Bannock Point Petroforms & Nutimik Museum
  - Granite Dimension Stone Quarry

Geological Features

- Sphagnum Peat Moss Operations
- Sandilands-Milner Ridge Interlobate Moraine (Seddons Corner – Sand and Gravel)
- Beausejour Glass Factory
- Tyndall Stone Operations
- Birds Hill – Belair Moraine (Birds Hill Provincial Park

Winnipeg Floodway Gypsum Rosettes





- Lake Agassiz clays are home to numerous gypsum or selenite rosettes that have been found along the route of the Winnipeg Floodway









(Matile and Betcher, 1998)

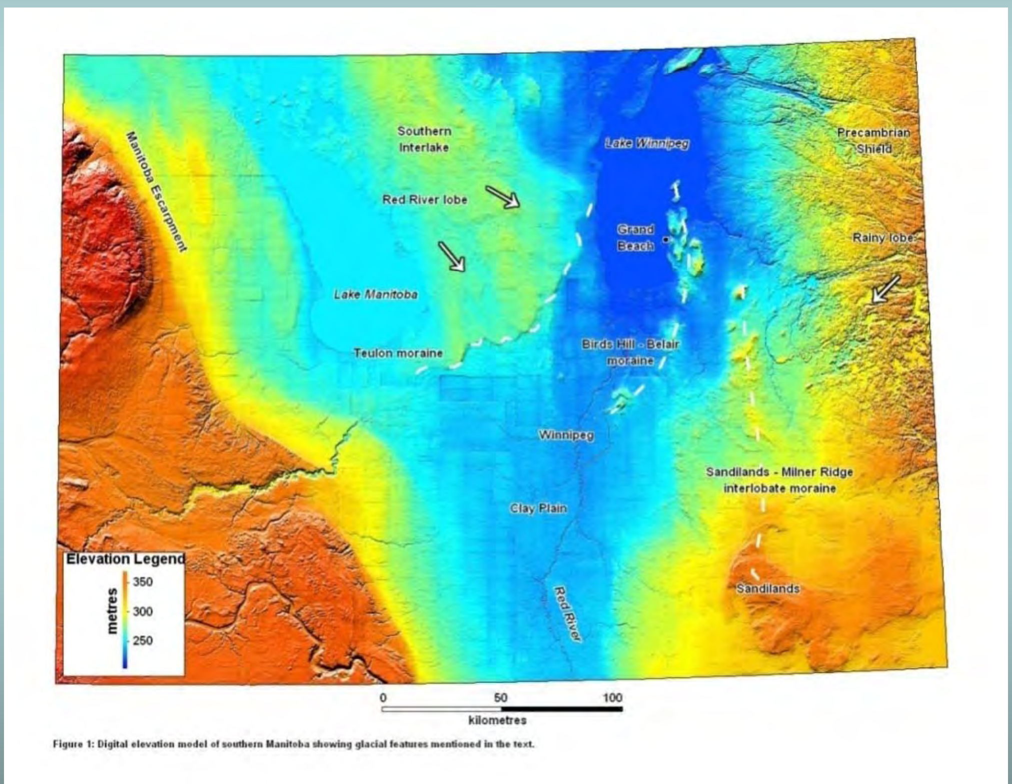
Iceberg Scour Marks



Teller et al. (1996)

- Iceberg scour marks are present on floor of glacial Lake Agassiz, southwest of the Trans-Canada Highway in the vicinity of Lorette, but are difficult to see from the ground..
- The lighter toned linears, shown in the picture, appear as ridges, today, due to differential compaction of the silt-infilled scours, relative to the softer surrounding clay bottom (from dewatering, after the drainage of Lake Agassiz).
- A vestigial groove is present in the clay base beneath each ridge, which can be up to 150 m in width and over 10 km in length.
- The silty linear ridges are better drained and relatively low in organic matter compared to the surrounding clay.

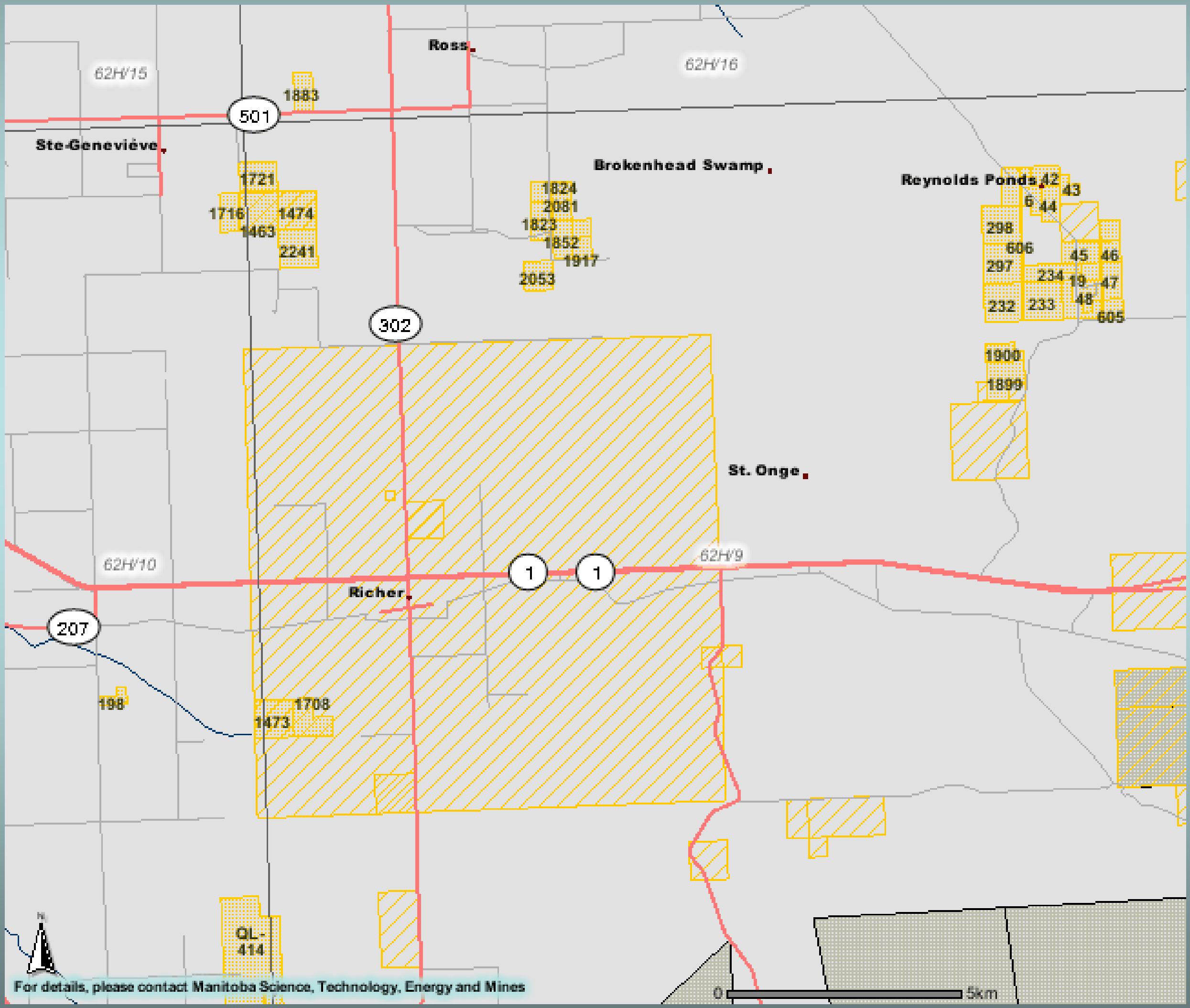
Sandilands – Milner Ridge Interlobate Moraine



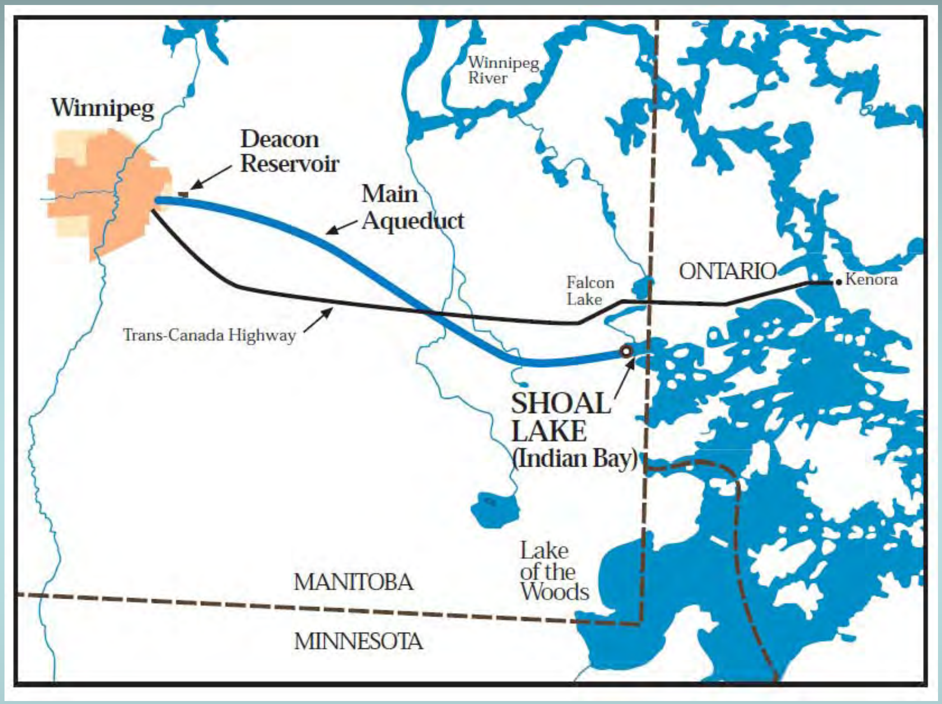
Digital Elevation Model (NASA)

- Crossed by the Trans-Canada Highway, a short distance east of Richer.
- Developed at the margins of two ice lobes.

Richer East Sand and Gravel Quarry Leases & Withdrawals



Winnipeg Aqueduct

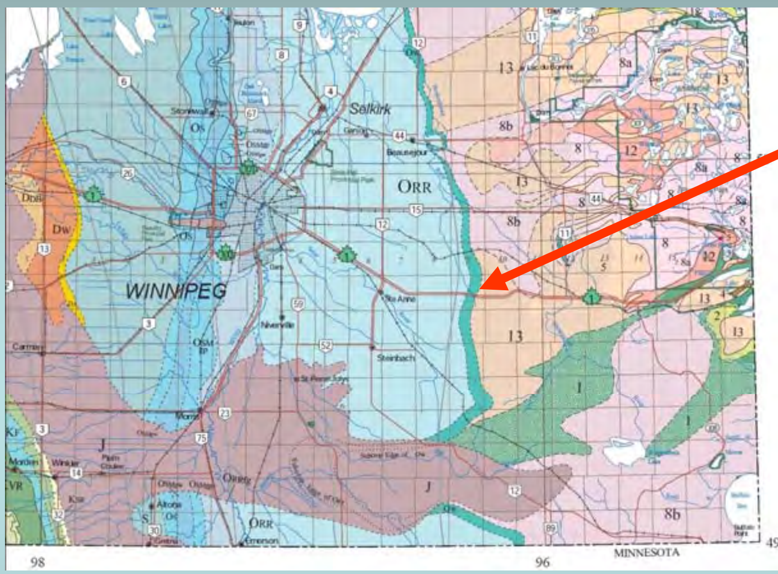


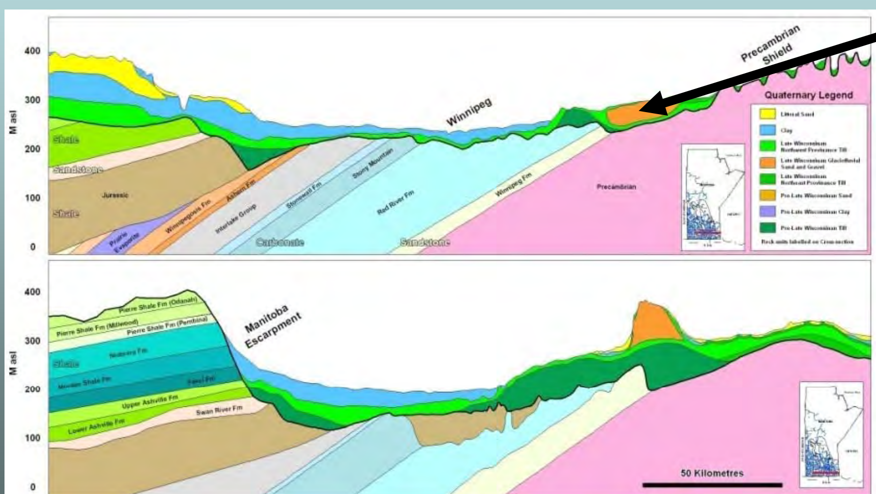


AQUEDUCT CONSTRUCTION, MILE 76

- Length: 135.18 km.
- Earth excavated: 1 650 673.94 m^3.
- Gravel used for base: 217 133.58 m^3.
- Concrete used: 270 717.41 m^3. produced from 600 000 barrels of cement.
- Source of water: Indian Bay on Shoal Lake at an elevation 92 m above Winnipeg.
- Constructed from Sept. 19, 1914 to Mar. 29, 1919, at a cost of over $13 million to supply a projected population of 850 000.
- “One of the longest gravity-fed covered aqueducts in the world since the early Romans pioneered aqueduct construction more than 2000 years ago” (Rod McRae, Winnipeg Commissioner of Works and Operations, April 15, 1994).

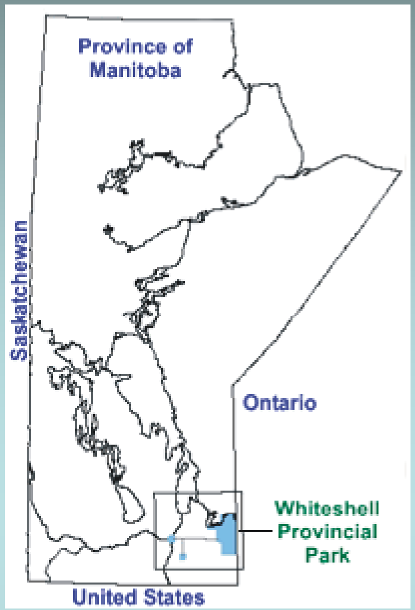
Precambrian Shield

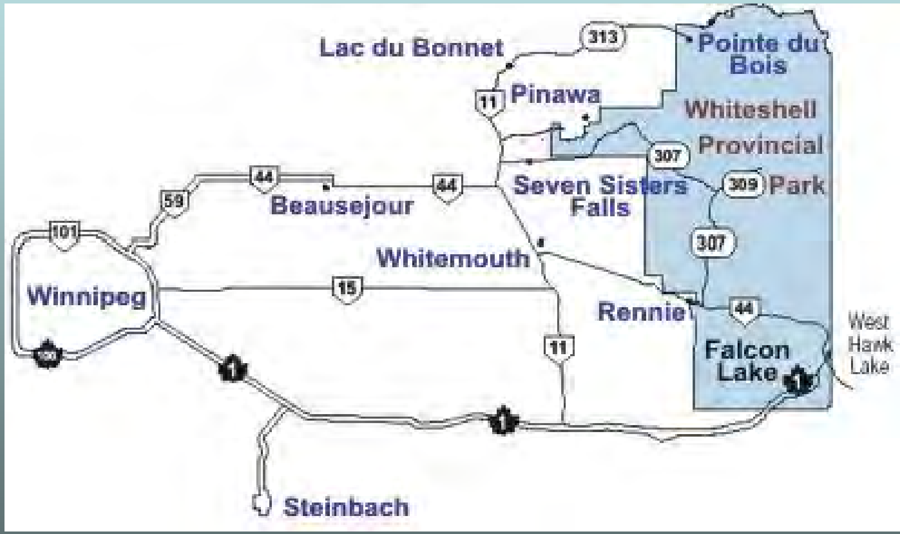


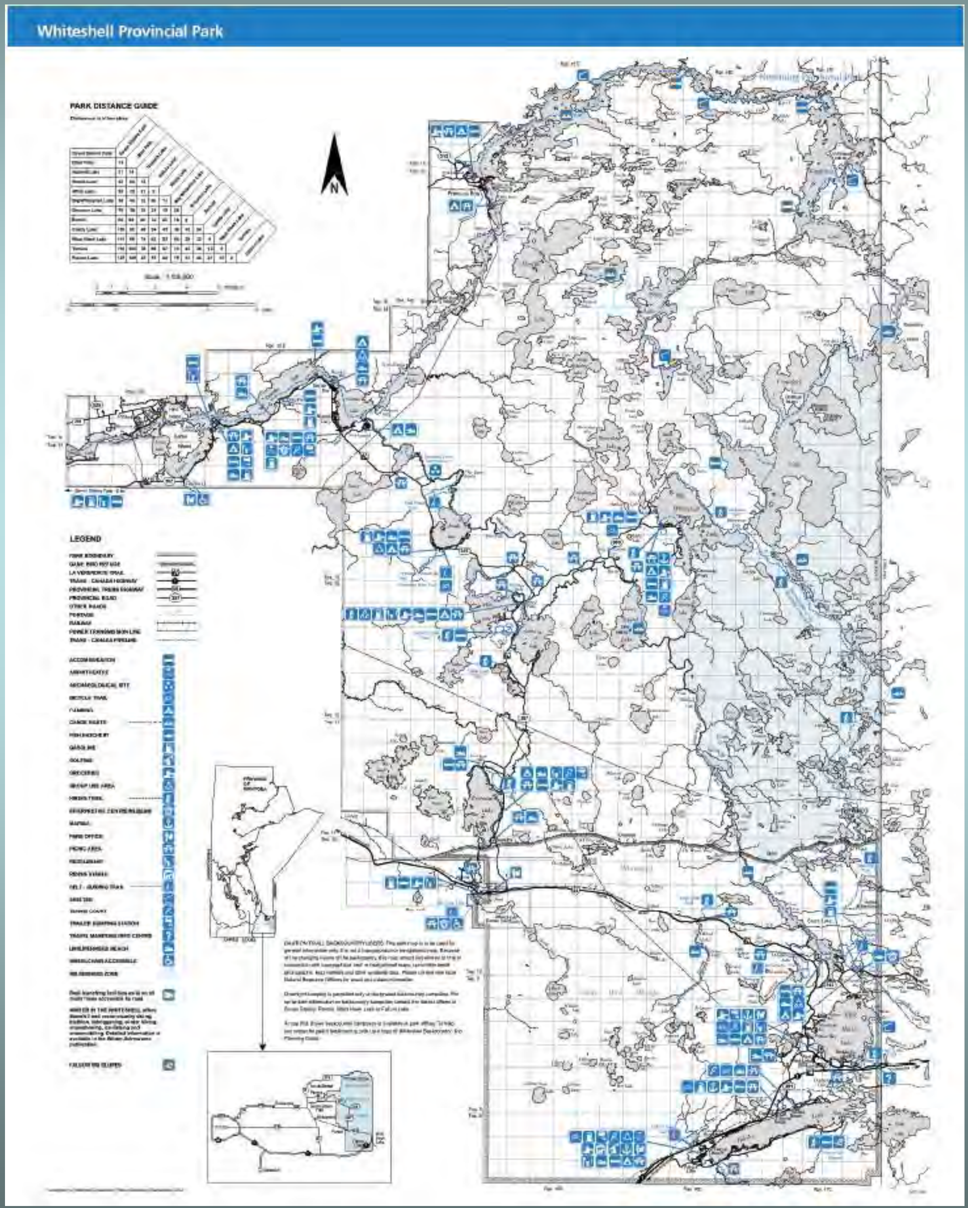


- The Precambrian is present in the sub-surface directly beneath glacial sediments where the Trans-Canada Highway crosses the Brokenhead River.
- However because of the thickness of the Sandiland – Milner Ridge Interlobate Moraine, the first appearance of Precambrian granitic rocks at surface, is not until you cross the Whitemouth River.
- Next time you travel east along the Trans-Canada Highway, see who can be the first to spot the first Precambrian outcrop.

Whiteshell Provincial Park

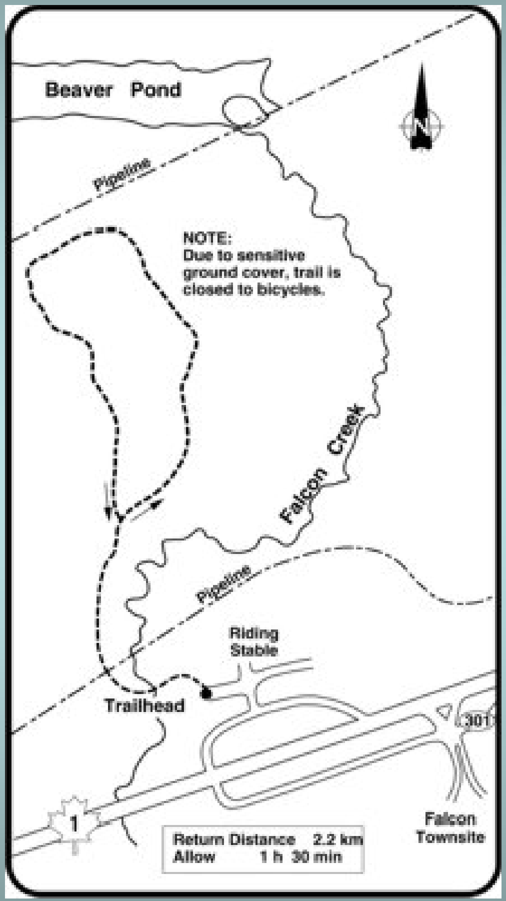






Falcon Creek Hiking Trail





http://www.gov.mb.ca/conservation/parks/popular_parks/eastern/whiteshell_falcon.html#before

Pillow Lava



2 billion year old pillow lava, south of Star Lake

- Volcanic rock south of Star Lake includes distinctive pillow lava (similar to that being presently formed in the Hawaiian Islands)

Pictures taken from Hawaii Undersea Research Laboratory taken Feb. 2008, Big Island, Hawaii



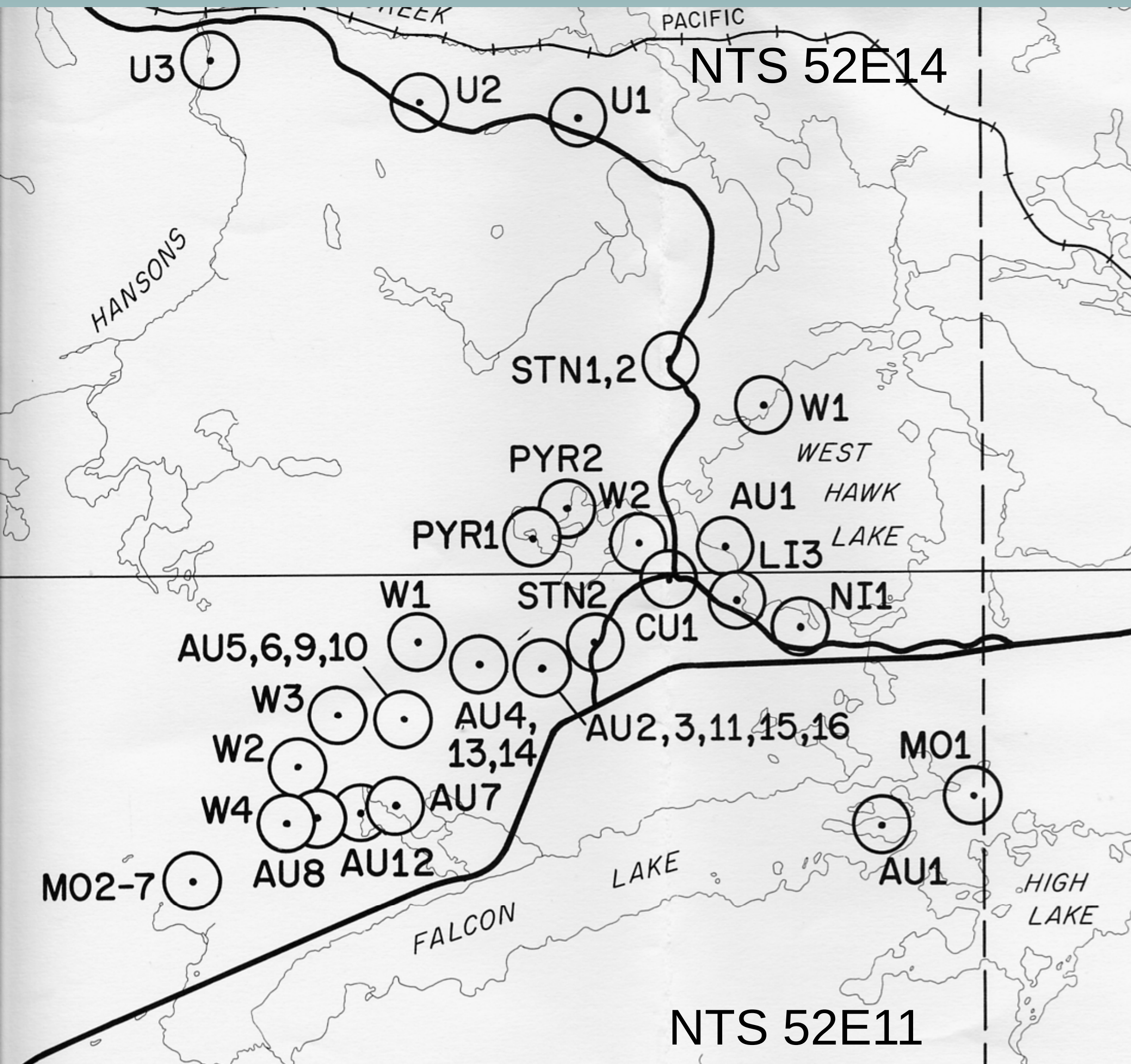


Pillow Lava from Loihi Volcano

Much of Loihi's surface is covered with rounded "pillows," the form basalt lava commonly takes when erupted underwater. Parts of three pillows are contained in this specimen. High seawater pressure at the collection depth of 1180 meters retarded the release of gases from the lava, keeping the vesicles, or gas bubbles, small and few in number. The pillows' thin glassy veneer resulted when the hot lava erupted into cold seawater.

Lent by Hawaii Undersea Research Laboratory (HURL)

Mineral Occurrences in the West Hawk – Falcon Lake area



- Numerous mineral occurrences are present in the West Hawk – Falcon Lake area, as shown on the map with symbols from the Mineral Inventory file.
- Details of these occurrences can be found on the Manitoba Geological Survey website at: http://www2.gov.mb.ca/ltm-cat/minsearch.htm.
- Some of these gold occurrences have been in production in the past.

Moore (Penniac Reef Mine)



Late 1890's



1913-15



Penniac Reef Mine produced several gold bars during 1913 to 1915.

Sunbeam (Sunbeam Kirkland Mine)



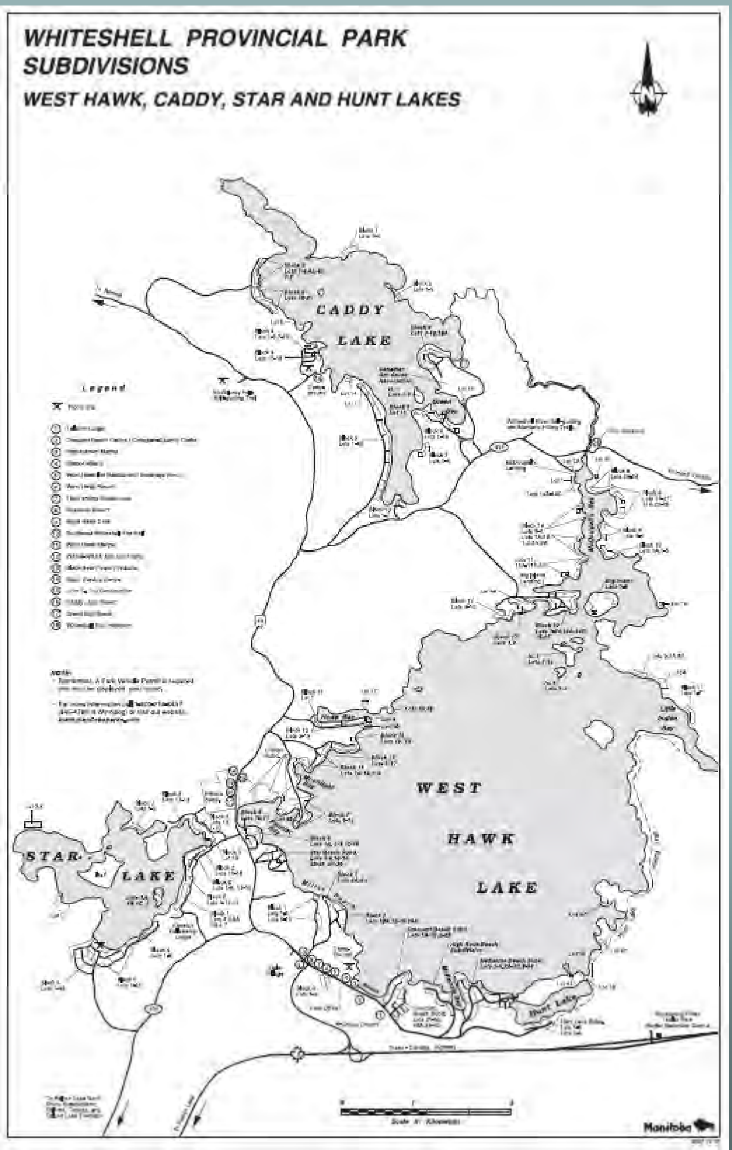
Circa 1941

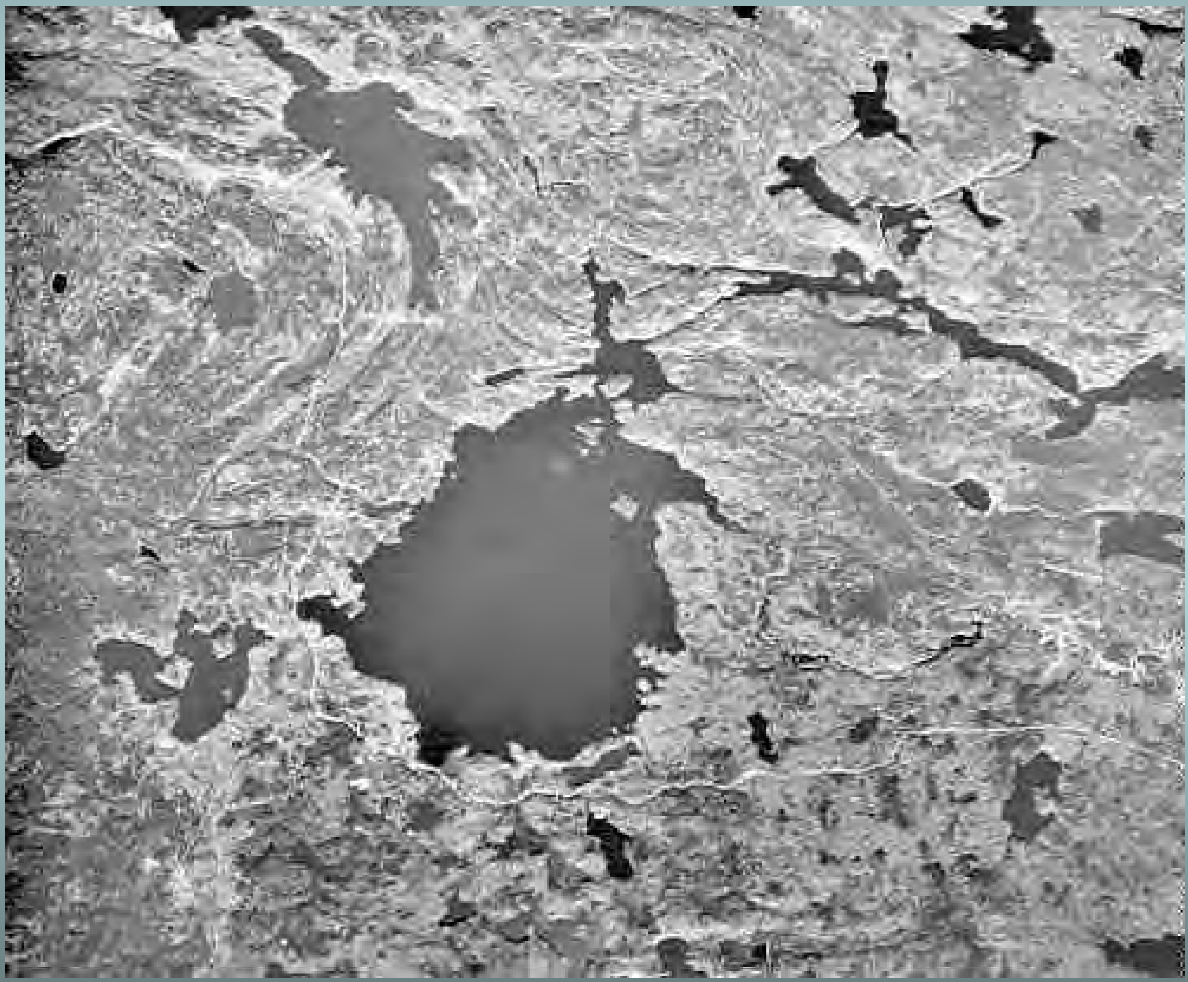


1986

Sunbeam Kirkland Mine produced 24.70 kg of gold (worth over a half million dollars at today's prices) in 1940. Mine was also called Goldbeam Mine, Homestake Mine, Star Lake Mine

West Hawk Meteorite Impact Crater





Meteorite impact crater and deepest lake in Manitoba (111 m)

West Hawk Meteorite Impact Crater



Information sign at West Hawk Lake

West Hawk Lake Museum





http://www.gov.mb.ca/conservation/parks/interpretation/centres/wnhm.html

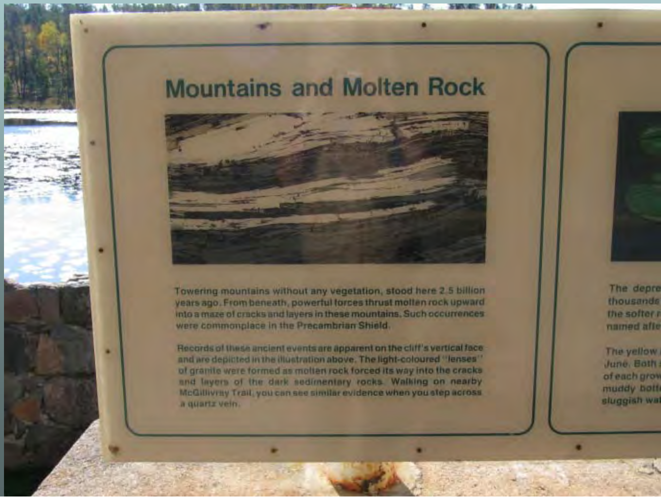
Lily Pond Lake



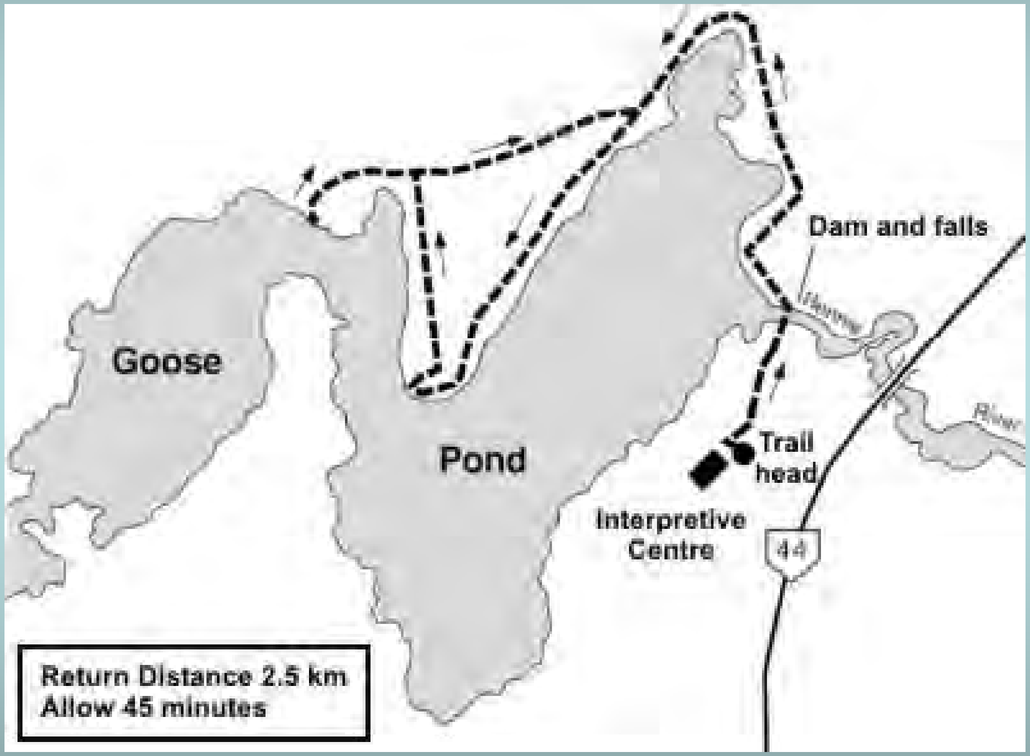




EdGEO Field Trip
Lily Pond Lake – October 2006
Precambrian sedimentary rock intruded by granitic sills and dikes



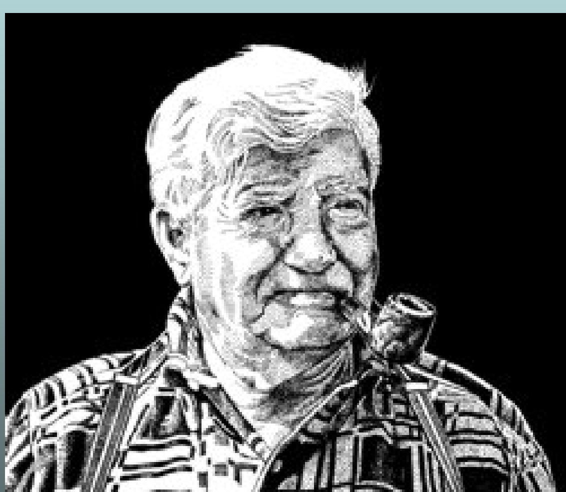
Rennie (Goose Sanctuary)



Walking trail at Alfred Hole Goose Sanctuary covers typical glaciated Precambrian terrain found over much of the Canadian Shield
http://www.gov.mb.ca/conservation/parks/interpretation/centres/alf_hole.html

Rennie (Goose Sanctuary)





- **The lake is probably a low area within Precambrian bedrock that had a restricted outlet that was enhanced with a dam to make an artificial lake. In this way, we copy the local beavers to produce a habitat suitable for wildlife.**
- **Question: Did Alfred Hole anticipate that the shape of the ponded lake would form [illegible] of a goose, a swan or a gr[illegible]**



Bannock Point Petroforms



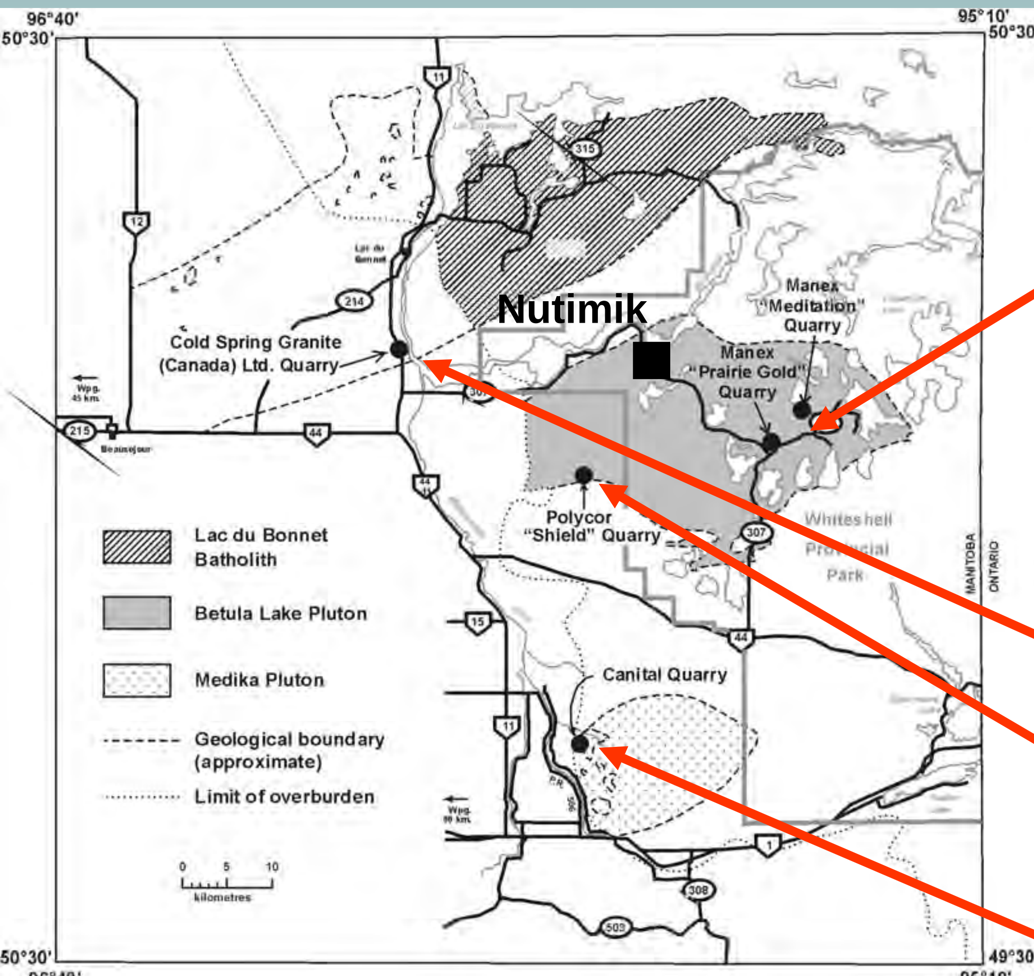


Bannock Point
snake and turtle

- **Bannock Point, one of the largest petroform sites in North America is in close proximity to Nutimik**
- **Petroforms are patterns made by arranging boulders into various shapes on the open stone outcrops typical of the Canadian Shield.**

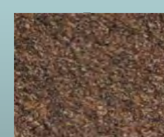
http://www.gov.mb.ca/conservation/parks/popular_parks/eastern/whiteshell_petro.html

Granite Dimension Stone Quarry at junction of PR 307 & 309

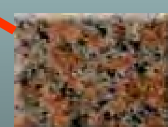


- **Two near-by dimension stone quarries at Meditation Lake and at the junction of PR 307 & 309 within Whiteshell Provincial Park**

- **Three other quarries located … t outside Whiteshell Park**



Lac du Bonnet



Royal Canadian Red



Northern Mahogany

Whiteshell Granite Dimension Stone









Modern Pictographs on granitic stone quarried in Whiteshell Provincial Park

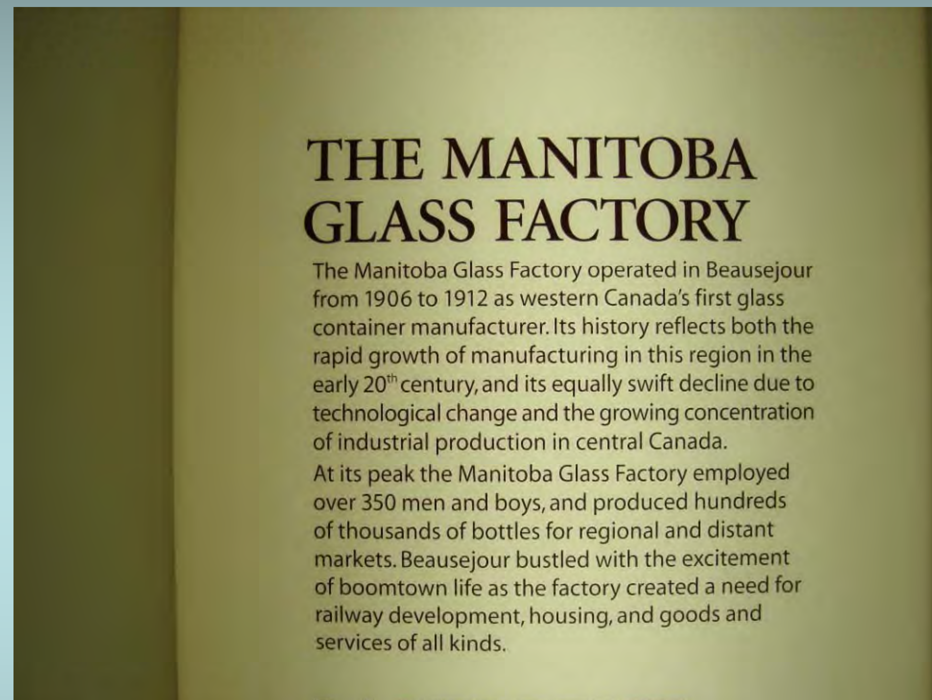
Spagnum Peat Moss Operations



- SunGro peat operations – two harvesting operations north and south of PTH 44

Beausejour Glass Factory









Display at Manitoba Museum

Tyndall Stone



- Tyndall Stone from the Ordovician Selkirk Member of the Red River Formation has been produced at Garson for over 100 years.
- Has been used across Canada: Museum of Civilization in Hull, Parliament Buildings in Ottawa, Legislative Buildings in Winnipeg and Regina, etc.
- Opportunity to collect Ordovician fossils from Gillis Quarries Limited rubble pile at $15? a visit

Birds Hill – Belair Moraine

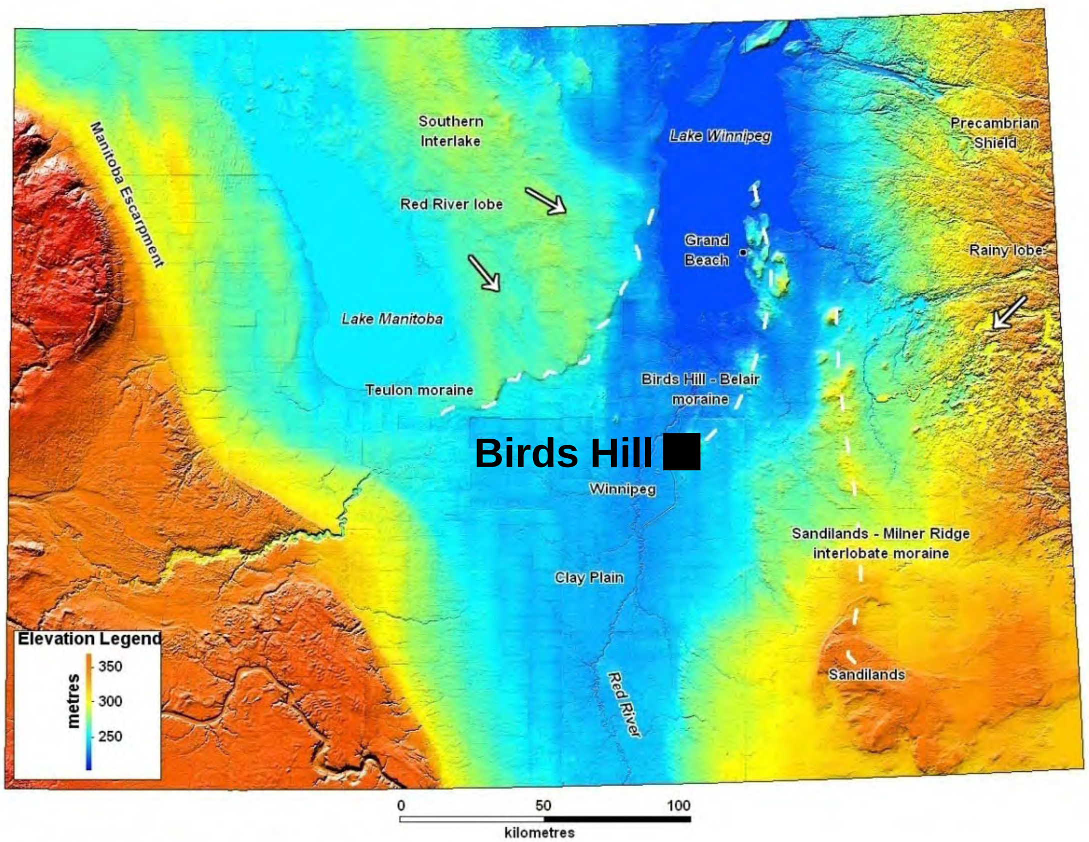
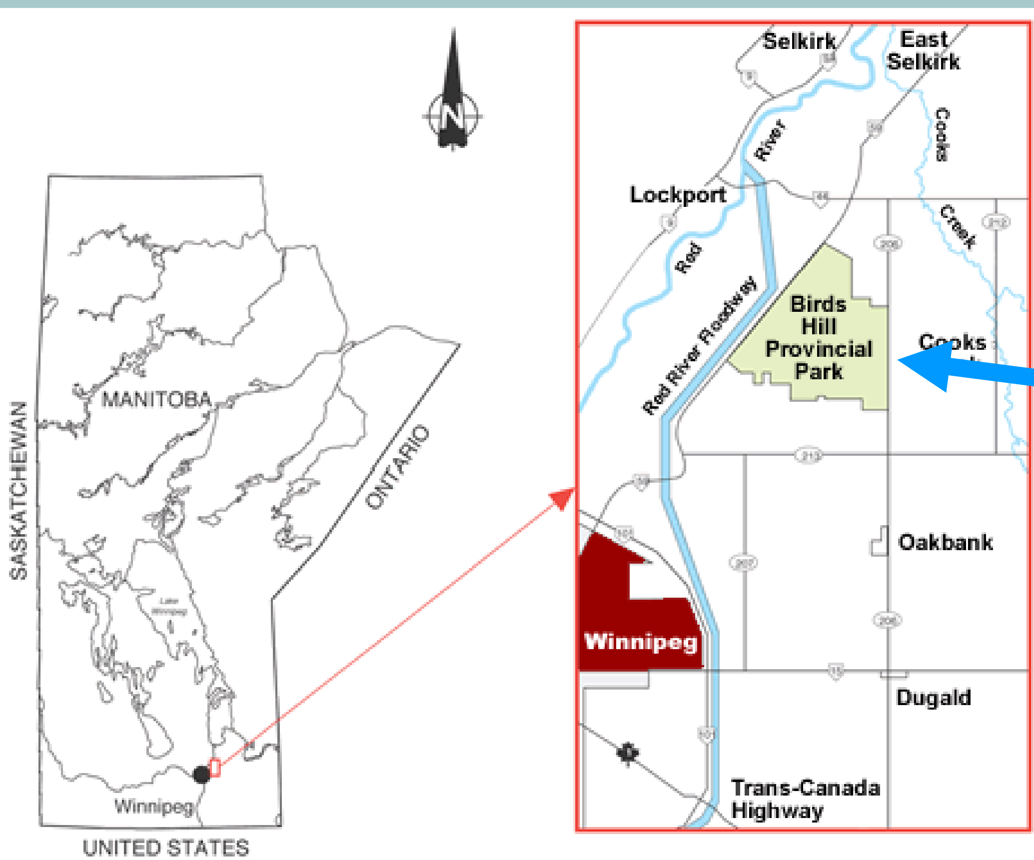


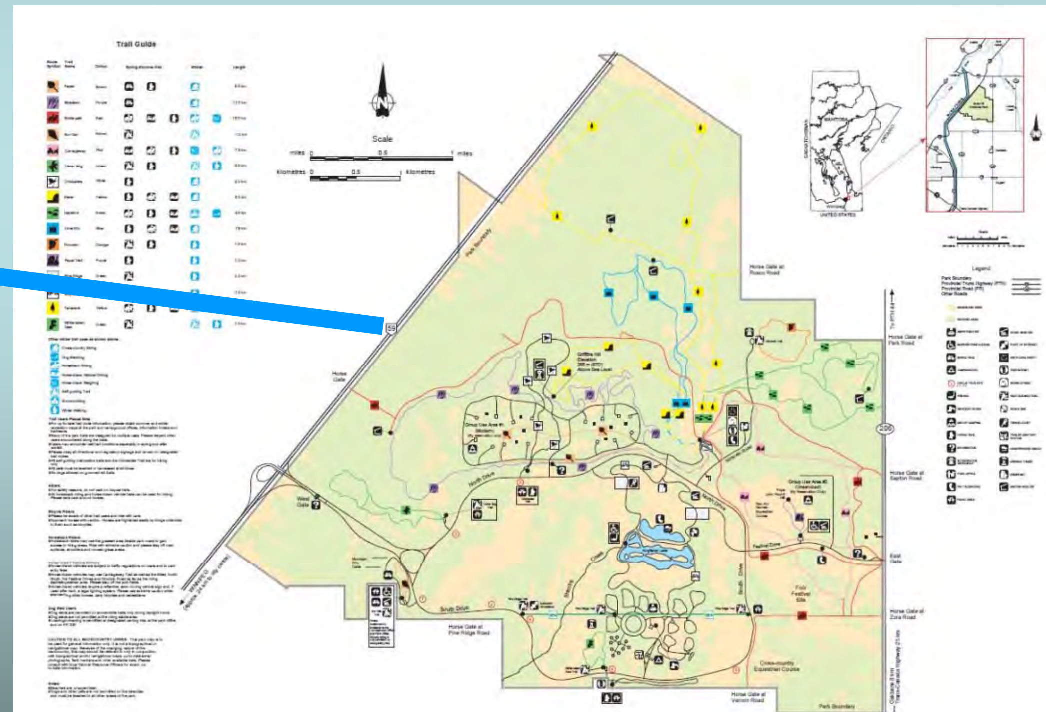
Figure 1: Digital elevation model of southern Manitoba showing glacial features mentioned in the text.

- Birds Hill was one of several islands in Glacial Lake Agassiz, 8100 years ago.
- Contains and is surrounded by former and active gravel pits.
- May have also had kilns to produce lime from glacially transported limestone boulders.



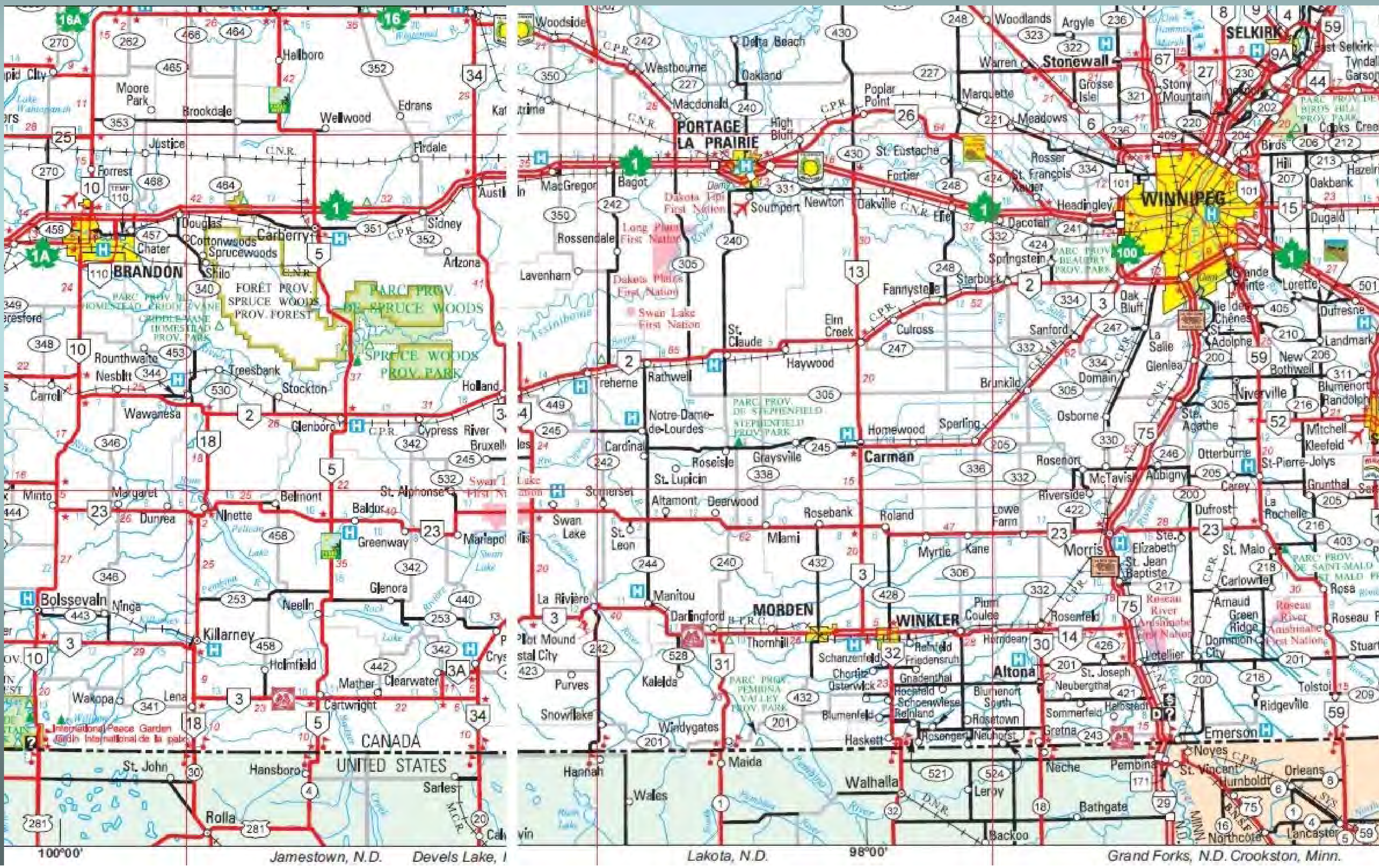
Birds Hill Provincial Park



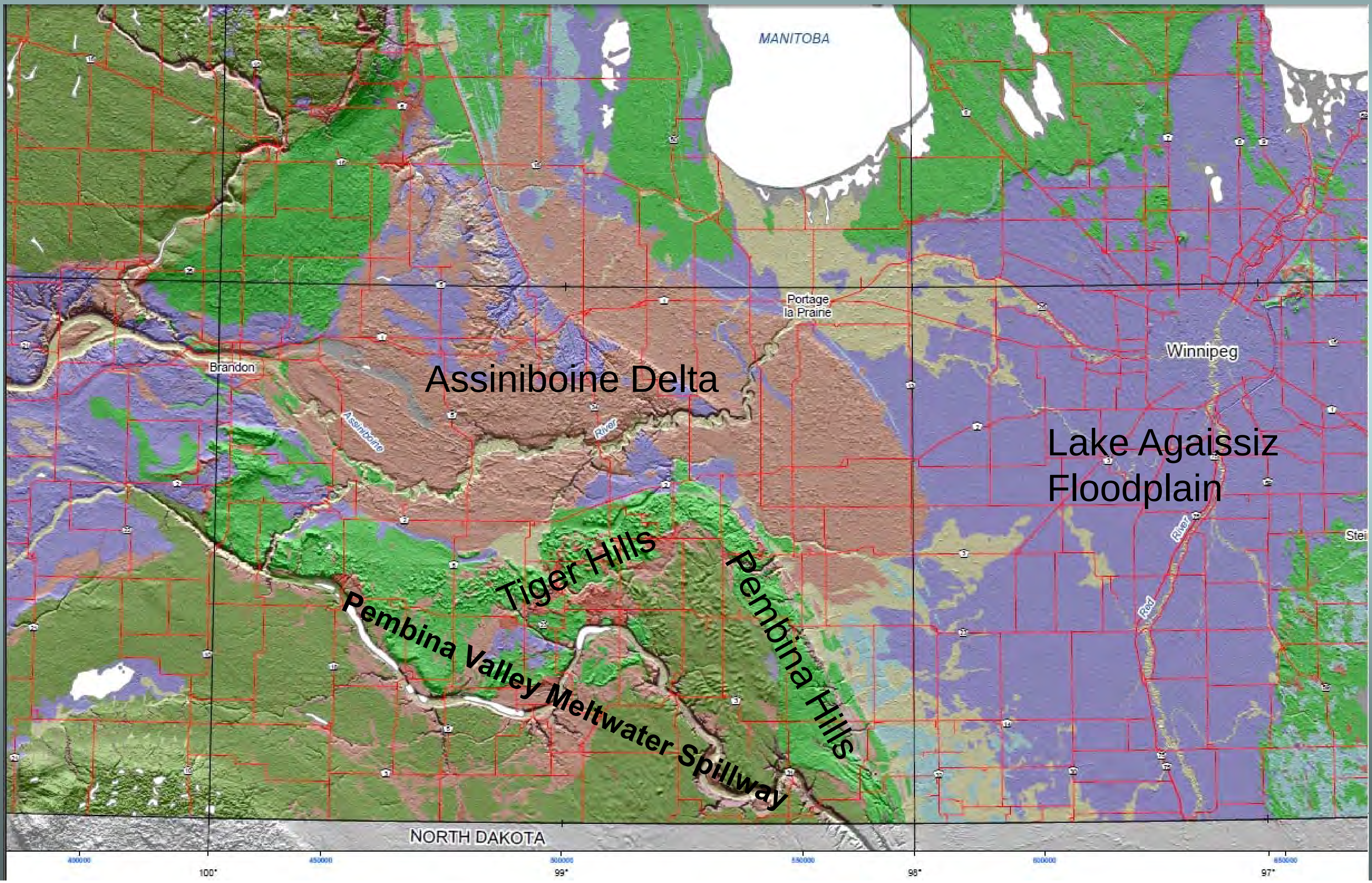


http://www.gov.mb.ca/conservation/parks/popular_parks/central/birds.html

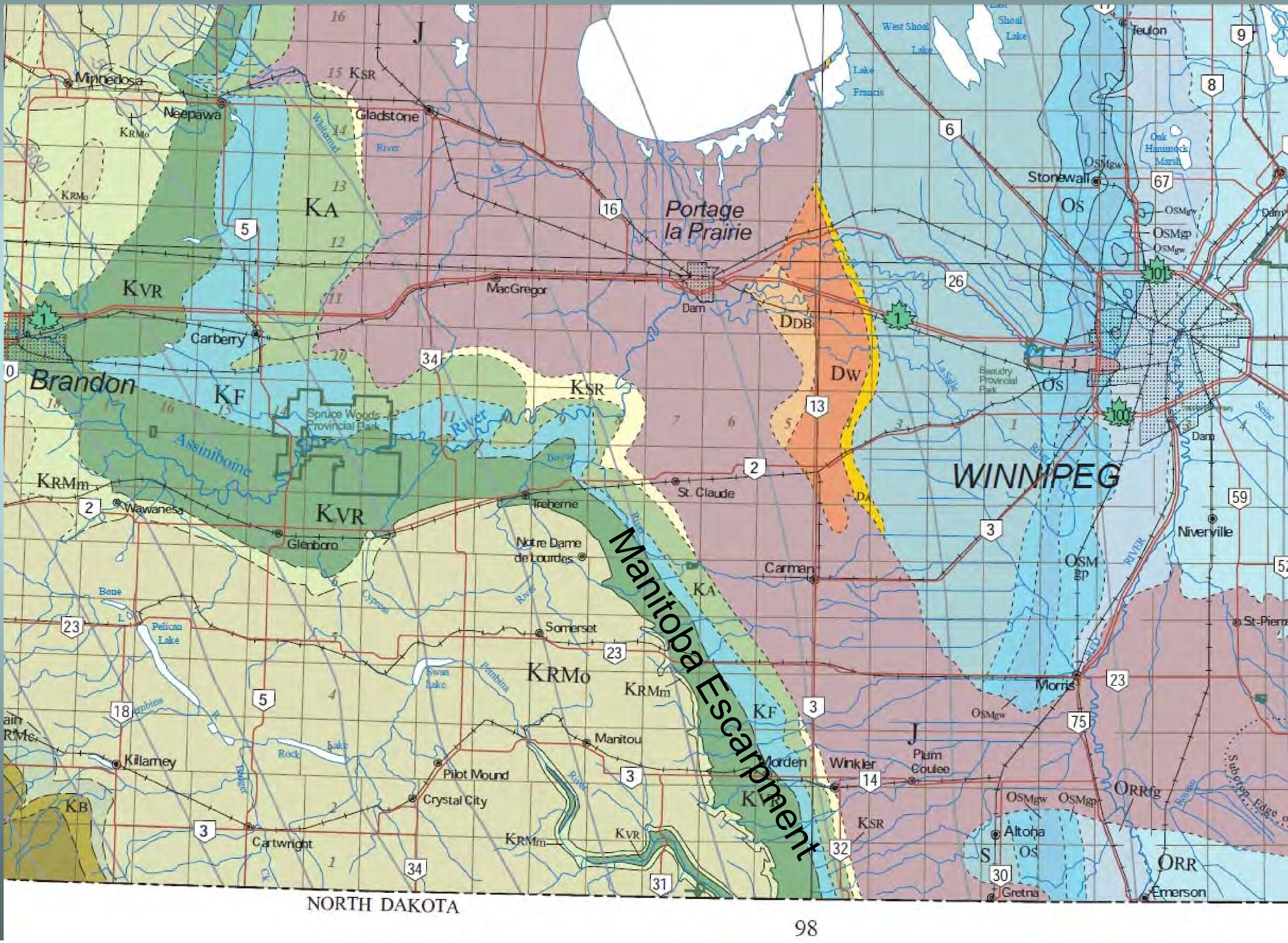
Western Roadside Geology Field Trip



Surficial Geology



Bedrock Geology



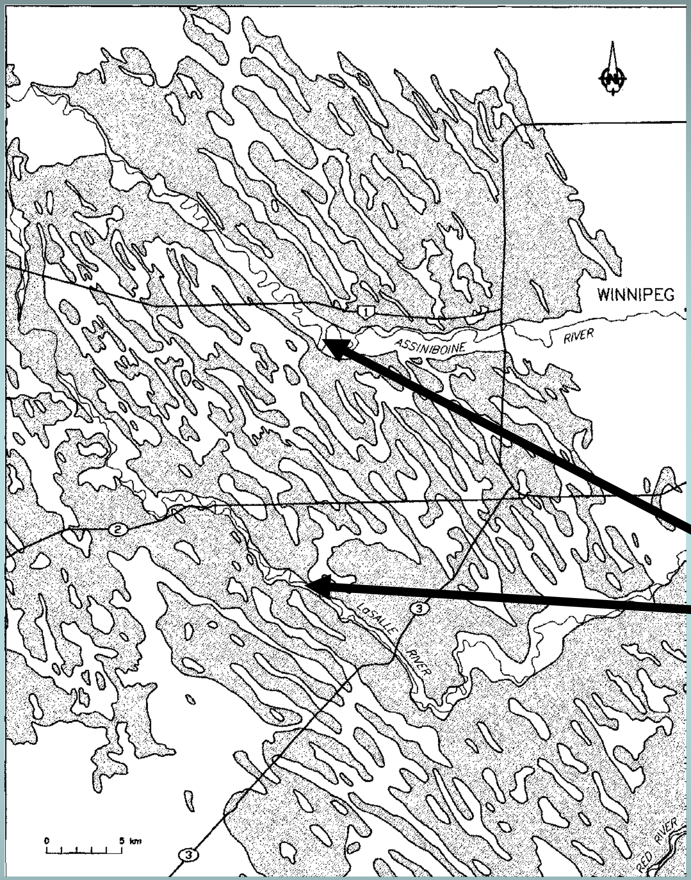
Geological Features

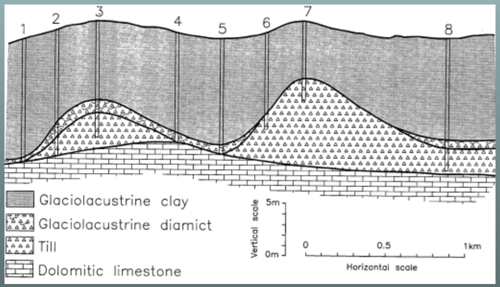
- Linear Clay Ridges
- Canadian Fossil Discovery Centre, Morden
- Pembina Valley Meltwater Spillway (Pembina Valley Provincial Park)
- Darlingford Moraine
- Leary’s Brick Plant

Geological Features

- Snow Valley (Roseisle Creek) and Babcock Cement Plant
- Spruce Woods Provincial Park
  - Souris-type gravels in Assiniboine River
  - Bald Head Hills (Carberry Sand Dunes)

Linear Clay Ridges





Teller et al. (1996)

- Linear clay ridges (also described as ridge and swale topography) are present southwest of Winnipeg, along PTH 3, from Oak Bluff to Brunkild, but are difficult to see from the ground.
- The shaded areas (in the upper picture) are the well-drained ridges whereas the more poorly drained troughs, are shown in white.
- Note that portions of the Assiniboine and La Salle rivers have been “captured” by the troughs.
- The ridges parallel regional ice flow and are up to 3 m high with a spacing of 1-3 km, and mimic the underlying till surface (lower picture), because of differential compaction of the clay due to dewatering of lake bottom sediments after drainage of Lake Agassiz .
- They are commonly found where Lake Agassiz clay is > 10 thick.

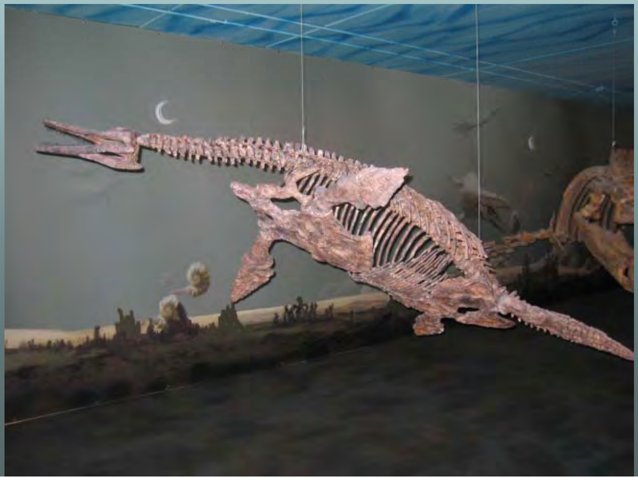
Canadian Fossil Discovery Centre, Morden











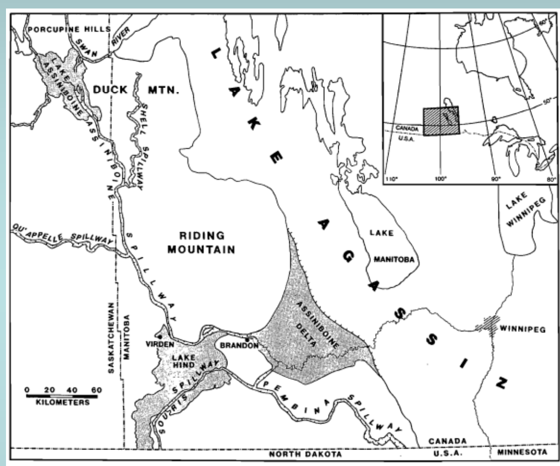
Canadian Fossil Discovery Centre, Morden



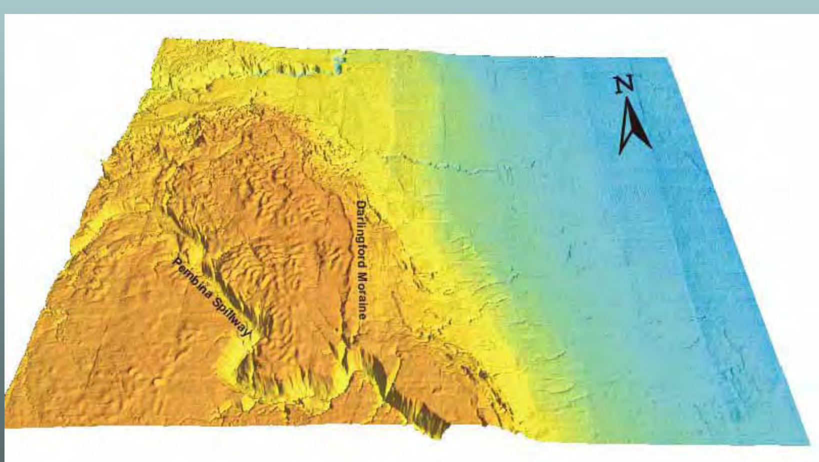
A Lovely Couple having a memorable moment with Santasaurus

http://www.discoverfossils.com/

Pembina Valley Meltwater Spillway



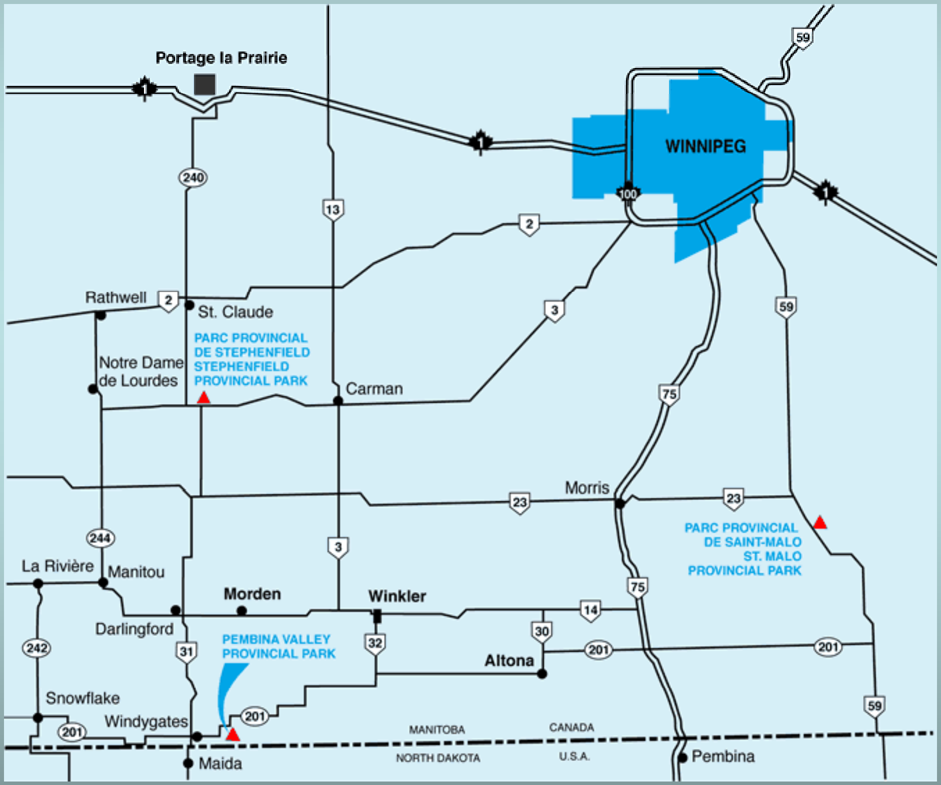
Teller et al. (1996)





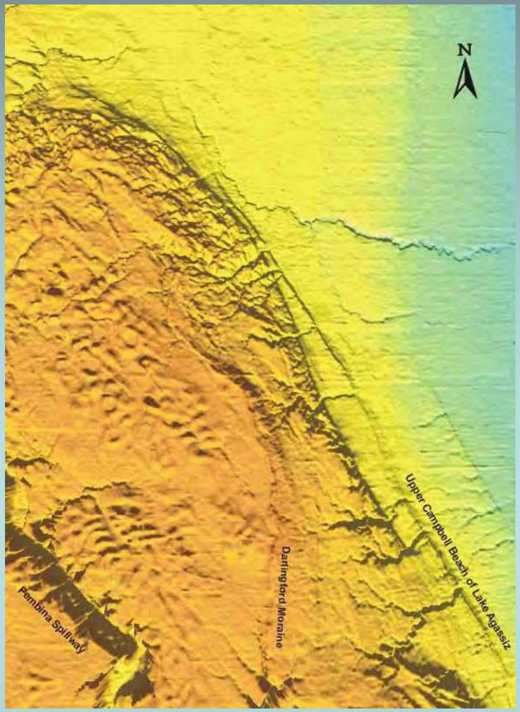
Pembina Valley Provincial Park

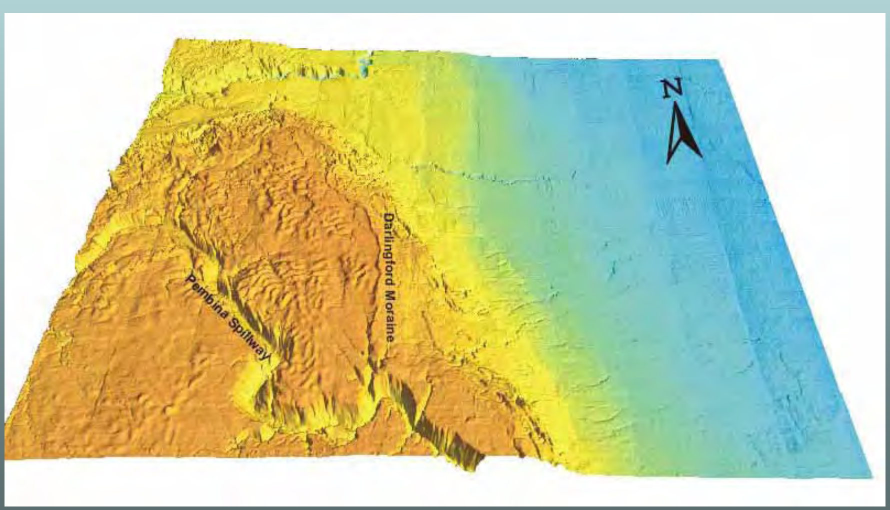




http://www.gov.mb.ca/conservation/parks/popular_parks/central/pembina_info.html

Darlingford Moraine





- Western limit of the Red River glacial ice lobe, one of the last lobes to leave Manitoba.
- Very thin and readily confined by any high area such as the Manitoba Escarpment.

http://www.gov.mb.ca/stem/mrd/geo/demsm/darlingford1.html

Leary’s Brick Plant



- Brick’s produced from the Cretaceous Morden Member of the Carlile Formation between 1900 and 1962 by several companies in Snow Valley (Roseisle Creek).

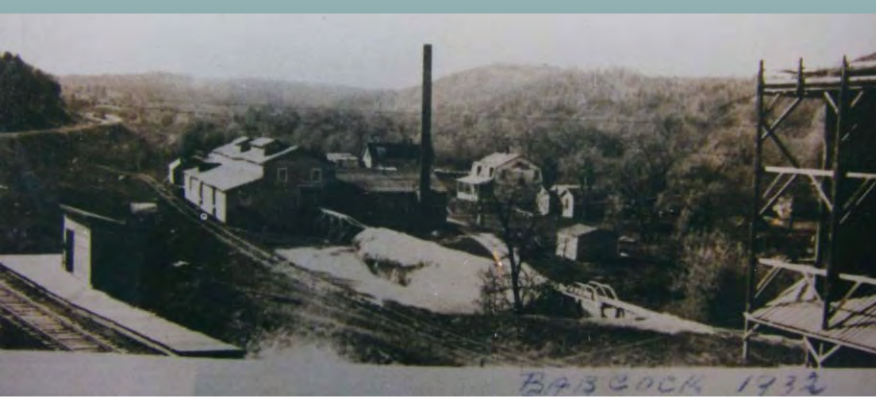




Snow Valley (Roseisle Creek) and Babcock Cement Plant



- Natural cement was produced from the Boyne Member of the Carlile Formation from 1907 to 1924 in Snow Valley (Roseisle Creek).

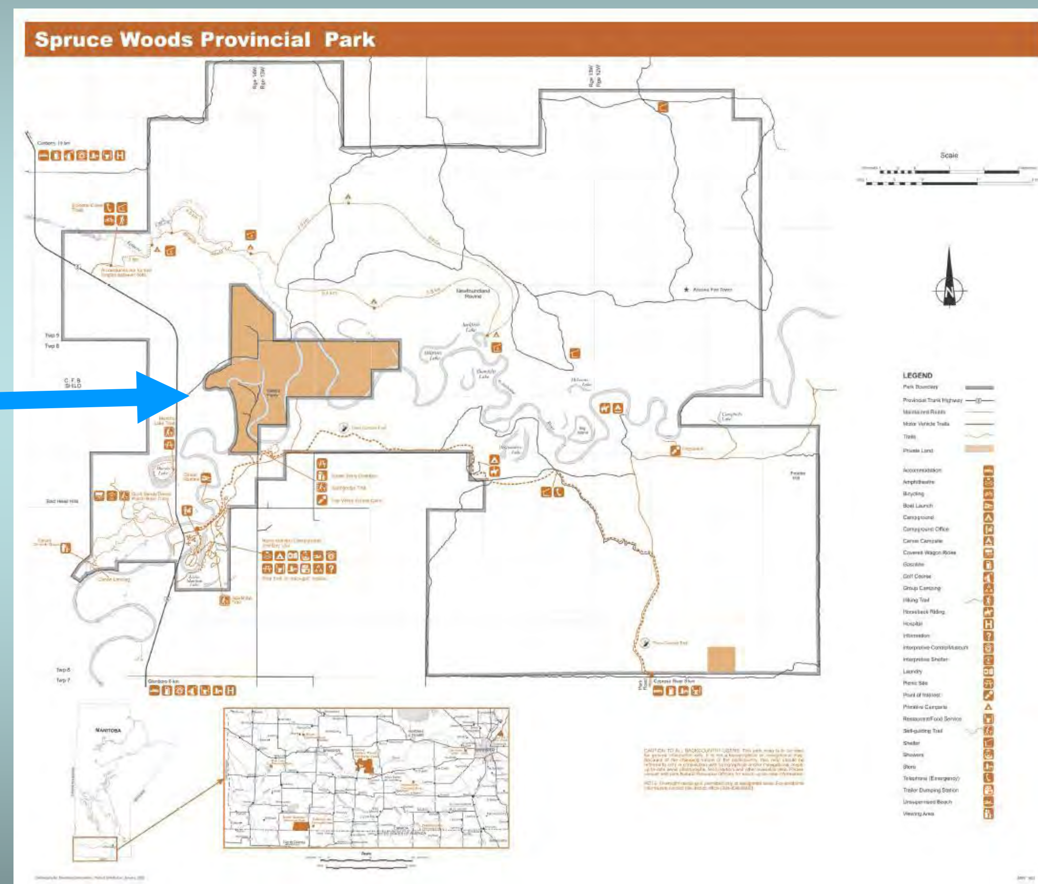




Clay oven built on old Babcock Plant foundations

Spruce Woods Provincial Park





http://www.gov.mb.ca/conservation/parks/popular_parks/western/spruce.html

Souris-type gravels in Assiniboine River





- Assiniboine River bed contains Souris-type gravels (petrified wood, agate, jasper) derived from Tertiary gravels from Alberta and Saskatchewan.
- Good access to river bed can be found north of Kichi-Manitou Campground.

Bald Head Hills (Carberry Sand Dunes)



Home to Manitoba's only desert that developed on the silts of the Assiniboine Delta, which formed in Glacial Lake Agassiz during the Pleistocene or Quaternary.

